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Case Report

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A rare blood transfusion complication: *Bacillus thermoamylovorans* bacteremia and diffuse pustular rash

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ABSTRACT

Bacillus thermoamylovorans is a species of bacillus that causes structural defects in milk by contaminating milk with its heat-resistant spores. We report a case of diffuse pustular rash on the extremities and *bacillus thermoamylovorans* bacteremia in blood culture after erythrocyte suspension replacement. On admission, his acute phase reactants were elevated and he had a generalized rash. After appropriate antibiotherapy, his lesions regressed almost completely. There is no case report of blood transfusion-associated *bacillus thermoamylovorans* bacteremia in the literature. This case is presented to contribute to the literature to show that *Bacillus thermoamylovorans* bacteremia may play a role in the etiology of pustular rash and infectious reactions associated with blood transfusion.

Keywords: *Bacillus thermoamylovorans*, rash, transfusion reaction

INTRODUCTION

Transfusion reactions occur in approximately 1% of all blood transfusions.1 Reactions due to blood transfusion are usually not life-threatening, but although rare, one in 200,000–420,000 units of transfusion reactions result in death.[1] Transfusion reactions are classified as immunologic and non-immunologic. Infectious reactions, which are non-immunologic transfusion reactions, can be caused by bacterial, viral, parasitic and fungal agents. Transfusion-transmitted bacterial infections (TTBI) are much more common than viral and parasitic infections.[2]

In this case report, a rare case of Bacillus thermoamylavorans bacteremia presenting with a diffuse pustular rash after erythrocyte suspension (ES) replacement is presented.

CASE

A 71-year-old male patient with known type 2 diabetes mellitus, benign prostatic hyperplasia and myelodysplastic syndrome, presented to our center with bilateral edema and red-purple non-blanching pustular rashes and bullous lesions on the upper and lower extremities that started 48 hours after red blood cell suspension replacement at an external center. The patient's rash had gradually increased in the last 2 days and spread to all of his arms and legs, he had a fever exceeding 38.0°C during this period.

On physical examination of the patient who presented to us on the fourth day of the rash, diffuse edema was observed in his bilateral hands and feet, as well as purpuras tending to merge on the soles of his feet, dorsum of his feet, and ankles. Purpuric plaques with pustules on them were more intensely present on the upper ankle and dorsum of the hand, decreasing in bruising and intensity towards the proximal. Bullous lesions were also observed on the dorsum of his right hand (Figure 1).

Oral mucosa was normal. There was no history of newly started medication or antibiotics in the patient's history. The patient had no history of raw milk products consumption but drank boiled milk in his daily routine. There was no change in his diet recently. The patient, who retired four years ago and was not actively working, waspreviously engaged in farming.

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Figure 1. Images of the patient's rash at the time of admission to our center (4 days after erythrocyte suspension replacement, 2 days after the onset of the rash)

The patient was consulted to the dermatology department and skin biopsies were performed with the prediagnoses of pustular vasculitis, Sweet's syndrome, and acute generalized exanthematous pustulosis. The patient had pancytopenia. hemoglobin: 6.0 g/dl (13.5-16.9 g/dL); leukocyte: 3.88x103/µL (3.91-10.9x103/µL) neutrophil: 2.75x103/µL (1.8-6.98x103/µL); platelet: 41x103/µL (166-308 x103/µL), ESR 30 mm/h (0-20 mm/h), CRP; 14.2 mg/dl (0-0.8 mg/dl) and procalcitonin; 0.42 ng/mL (0-0.1 ng/mL) were the results. herpes virus type 1 and type 2 polymerized chain reaction results were negative in the samples taken from the patient's bullae and blood. Rheumatologic markers sent for vasculitis were negative. In the follow-up, intravenous clindamycin 3x600 mg/day and cefazolin 3x2 gr/day were started empirically as the patient's lesions increased, acute phase reactants increased and skin ultrasonography was suggestive of infective pathologies. The patient's skin biopsy result was reported as "crust and bacterial impetiginization findings were observed on the surface of the sections, epidermis was generally normal, dense erythrocyte extravasation on the surface of the dermis, perivascular mild inflammation consisting of lymphocytes was observed. Kappa, lambda, IgG, IgA, IgM and C3 immunofluorescence was negative both in the vessel walls and epidermis. No evidence of vasculitis or drug reaction was detected. There is diffuse erythrocyte extravasation on the surface." There was no bacterial growth in the cultures obtained from skin lesions, but *Bacillus thermoamylovorans* grew in the blood culture. Bacterial growth time was reported as 2 days, 7 hours and 55 minutes. Colony count not specified.

Due to the presence of *Bacillus thermoamylovorans* species producing ßeta lactamase in the literature, cefazolin treatment was stopped and teicoplanin treatment was started. Clindamycin treatment was continued. No growth was observed in cultures obtained from separate vein and repeated blood cultures due to initiation of empirical treatment. The patient, who completed teicoplanin treatment in 14 days and clindamycin treatment in 10 days, showed almost complete regression in acute phase reactants(ESR; 17 mm/h (0-20 mm/h), CRP 3.97 mg/dL (0-0.8 mg/dL) and procalcitonin 0.13 ng/mL (0-0.1 ng/mL)) and skin lesions (Figure 2).

Figure 2. Images of the patient's rash after antibiotherapy (14th day of treatment)

DISCUSSION

The risk of bacterial contamination of blood products is 0.2-0.5%. However, in most of these cases, the number of bacteria is very low, so no clinical findings occur. Although bacterial contamination of blood products is a rare condition, symptoms such as fever, tachycardia, headache, as well as more severe clinical pictures such as septic shock, disseminated intravascular coagulation and death can be seen after transfusion of contaminated products.[2]

There are different results in the literature regarding the frequency of TTBI and the detected agents. The incidence of TTBI is higher in platelet transfusions stored at room temperature than in fresh frozen plasma and refrigerated erythrocyte transfusions.[2] According to German hemovigilance data, in most of the confirmed TTBI cases (72.5%, 29 cases), bacteria with medium or high human pathogenicity such as *Bacillus cereus, Escherichia coli, Klebsiella oxytoca, Klebsiella pneumoniae, Serratia marcescens, Staphylococcus aureus, Streptococcus agalactiae, Streptococcus gallolyticus, Streptococcus dysgalactiae* and *Streptococcus pneumoniae* were detected.[3] In TTBI cases reported to the National Healthcare Safety Network hemovigilance module in the United States between 2010 and 2016, the most frequently detected pathogens were Babesia spp. (16/23, 70%) in erythrocyte concentrates and Staphylococcus aureus (12/30, 40%) in platelet concentrates.[4]

Although bacteria isolated as *s.* were reported in the literature, no case report of *Bacillus thermoamylovorans* bacteraemia was encountered. While there is not enough information in the literature about *Bacillus thermoamylovorans* contaminating blood products, this case may be the first case reported of *Bacillus thermoamylovorans* bacteraemia developed after blood product transfusion.

Bacillus thermoamylovorans was first isolated and described as a gram-positive, moderately thermophilic, facultatively anaerobic, catalase-positive, non-sporulating, rod-shaped and peritrichous flagellated bacterium from palm wine, a tropical alcoholic beverage sampled in Senegal in 1995.[5]

However, a more recent study has shown that this bacterium is actually a spore-forming bacterium.[6]

The bacteria were subsequently isolated from thermal regions, including hot water sources such as spa water.[7] Through their spores that survive at ultra-high temperatures (UHT) and are resistant to pasteurization and heat, these bacteria contaminate milk, causing bad taste and structural defects in milk.[8]

There are case reports about the development of cutaneous infection with some bacillus species.[9,10] There is no case report in the literature showing any association between *Bacillus thermoamylovorans* bacteraemia and development of cutaneous infection/pustular rash.

Blood culture is taken under sterile conditions in our center and the risk of contamination is low. Considering the patient's clinical condition and response to antibiotherapy, contamination was not considered. Since the patient developed deterioration in general condition, fever and rash after transfusion and did not go out of his daily routine except for transfusion recently, the agent grown in the blood culture was attributed to transfusion in the foreground. Attempts were made to contact the transfusion center but without success. The transfused product could not be reached. The significant regression of symptoms and acute phase reactants with appropriate antibiotherapy was considered as strong evidence that the present clinical presentation was related to *Bacillus thermoamylovorans* bacteremia.

Since no transfusion product was found, our case can be considered as a highly probable suspicious TTBI case. The case was registered as a TTBI case by the infectious diseases department and the hematology department.

CONCLUSION

Bacteremia after blood transfusions, although rare, can be seen. This case is presented in order to contribute to the literature in terms of being a case in which *Bacillus thermoamylovorans*, that is a very rare agent in the etiology of both pustular lesions and infections that may develop after blood transfusions, was detected.

ETHICAL DECLARATIONS

Informed Consent

The patient signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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